TOOL FOR EXTRACTING DAMAGED FASTENERS AND METHOD OF USING SAME

PRIORITY CLAIM

[0001] The instant application is related to, and claims the benefit of, Provisional U.S. Patent Application Ser. No. 60/563,804, which is incorporated by reference herein in its entirety.

GOVERNMENT RIGHTS

[0002] The invention described herein was made in the performance of work under NASA Contract No. NAS9-20000 and is subject to the provisions of Section 305 of the National Aeronautics and Space Act of 1958{42 U.S.C. 2457}.

FIELD OF THE INVENTION

[0003] The present invention relates to the field of mechanical tools, and more particularly provides a tool for extracting screws and other such fasteners.

BACKGROUND OF THE INVENTION

[0004] Threaded fasteners, such as but not limited to wood screws, machine screws, bolts, and the like, routinely break or otherwise become damaged and must be extracted or removed from the part to which they are secured. Unfortunately, the damage frequently occurs when the part is being disassembled, and without completely removing the fastener, the part cannot be disassembled. The prior art has attempted to address the need to extract broken or otherwise damaged fasteners from the part to which they are fastened. The following disclosures evidence the approaches undertaken by the prior art:

[0005] U.S. Pat. No. 4,078,458, to Berendzen, the teachings of which are incorporated herein by reference in their entirety, proposes a screw extractor that has, as its leading portion, a simple drill bit, and as a following portion an extractor bit which grippingly binds against the internal walls of a discrepant screw so that the screw can be removed with an unscrewing motion. The entire assembly is capable of being inserted into a standard drill chuck and operated without the need to switch from drilling mechanism to extraction bit.

[0006] U.S. Pat. No. 4,688,315, to Jannke, the teachings of which are incorporated herein by reference in their entirety, proposes a screw extractor tool and a method of using the tool. The tool includes a tubular end portion with cutting teeth. It can be used to cut away exterior portions of an embedded screw or to bore into the screw and exert unscrewing force.

[0007] U.S. Pat. No. 4,777,850, to Polonsky, discloses a combination tool capable of extracting bolt fasteners. The extraction mechanism is combined with a drill head so that the drilling and extracting steps are performed in the same operation. A drive head is provided for enhanced performance.

[0008] U.S. Pat. No. 5,031,487, to Polonsky, discloses a right-hand threaded shaft having a left-hand drill bit at its lower end. The shaft has an invertible collet which tapers toward its lower end and carries exterior left-hand threads. Because the shaft is split and expandable, it is capable of acting as a gripping mechanism once the drilling portion of the bit is extended into the broken fastener.

SUMMARY OF THE INVENTION

[0009] While the prior art fastener extractors work in certain situations, the prior art tools are not particularly useful in clean room and other such environments where it is necessary to avoid the introduction of even trace amounts of particulate matter. Accordingly, the present invention is directed to a fastener extraction tool that substantially obviates one or more of the problems due to limitations and disadvantages of the related art.

[0010] An object of the present invention is to capture and retain as much of the extracted fastener as possible, thereby limiting contamination of the surrounding environment.

[0011] Another object of the present invention is to provide a jam wheel to tighten the tool onto the fastener head.

[0012] A further object of the present invention is to provide a manual hand wheel to facilitate extraction.

[0013] Still another object of the present invention is to provide a drill mechanism which includes a drill stop and gripping means.

[0014] Additional features and advantages of the invention will be set forth in the description which follows, and in part will be apparent from the description, or may be learned by practice of the invention. The objectives and other advantages of the invention will be realized and attained by the structure particularly pointed out in the written description as well as the appended drawings.

[0015] The present invention provides a tool capable of extracting broken, stripped, cross-threaded, or otherwise damaged fasteners from the part which they secure. The present invention includes a head grip that is preferably tightened around any exposed portions of the fastener, and drill-out components designed to fit inside a standard fastener cavity without damaging nearby structures. By gripping exposed portions of the fastener, foreign objects and debris that result from the removal process can be contained within the tool so that foreign particles are not left in the vicinity of the removed fastener. A drill stop is also preferably included to prevent overdrilling, and a manual hand wheel facilitates extraction.

[0016] Once the tool is adjusted for the depth of the remaining portion of the fastener and is properly seated, the jam wheel is used to tighten onto any exposed portion of the fastener, such as a screw head. This connection alone may facilitate removal by spinning the hand wheel. If not, the exposed portion can be drilled out and the balance of the fastener extracted by a gripping means, such as, but not limited to, a threaded gripping means.

[0017] It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory and are intended to provide further explanation of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this specification,